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Mr. Bruce Brumfield

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Route 287 Median Design 4/12/82 2-5722

SUMMARY AND CONCLUSIONS

Initial cost analysis for the yet to be built eight mile section of Route 287 suggests that a major cost reduction may be realized if the median was designed at less than the 60 foot width normally preferred by t is Department. A median width of 20 feet or less would negate the need for substantial portions of cut and fill which would result from a wide median in the terrain that Route 287 will traverse.

However, it is anticipated that utilizing the New Jersey concrete median barrier, the likely median design alternative, will result in an increase in accidents. For this reason, the assistance of the Division of Research has been requested in estimating the associated accident costs which would detract from the reduced construction costs.

The investigation reveals that approximately $120,000 per year in additional accident costs to the public can be anticipated if a concrete median barrier were installed in a median typically 22 feet wide. Such a median would typically contain two 10 foot wide shoulders and the two foot wide barrier.

The analysis requires the assumption that New Jersey experience with concrete median barriers is directly relatable to California 1973 data. California data was substituted for New Jersey data because New Jersey data is not currently available and would be too expensive to develop.

BACKGROUND

Current state-of-the-art practices for estimating costs due to accidents involving various median designs has been reviewed. The 1977 AASHTO "Yellow Book" (Guide for Selecting, Locating and Designing Traffic Barriers), its 1980 Supplement, as well as NCHRP Report 148, "Roadside Safety Improvement Programs on Freeways" propose procedures for making cost analyses on the basis of single vehicle run-off-road accidents.

These references recommend the use of recent local accident data whenever possible rather than the nationally averaged data contained in the reports and used for examples. Recent local data has been requested from our Accident Records system, but as of this writing it is unclear when it will become available and further questionable how successful the system will be in grouping locations whose characteristics are of sufficient similarity to Route 287 to be of value.

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Base information for the AASHTO Guide and NCHRP Report 148 is generally eight or more years old and the method is dependent on an ADT relationship first established some 16 years ago. California has yet to break down their information by design policy and ADT, but they have computed some statistics for accidents related to median barriers which can be utilized. "Median Barriers in California" dated 1975 (and since updated) documents a substantial amount of barrier accident experience.

Several studies are currently underway to update these methods and data. NCHRP Project 17-5 has been addressing "Effectiveness of Clear Recovery Zones" but is limited to low ADT (5,000 to 10,000 vehicles per day) locations. An FHWA sponsored study being done on Houston freeways will address higher ADT applications. In addition, both California and Michigan are doing research aimed specifically at median barrier cost effectiveness based on accident experience. Of these current studies, only NCHRP Project 17-5 is near completion. (A copy of the draft report "Effectiveness of Clear Recovery Zones" was reviewed.)

PROCEDURE

As a result of the lack of New Jersey data summaries (to date) and reservation over the AASHTO methods (without New Jersey data), the following two phase approach has been taken to address the median design comparison requested for Route 287 in New Jersey.

First, the AASHTO method has been utilized to develop estimates of projected median accident experience for medians of each of the two alternative designs (see Table 1). Secondly, AASHTO method estimates were made for the 22 foot median of California experience which was exposed to high ADT and compared with reported data (see Tables 2 & 3). This comparison produced ratios which were then applied to the AASHTO accident estimates for Route 287 from Table 1 and compared with accident costs which were adapted from (1975) NHTSA data per the 1980 AASHTO Supplement to produce the costs in Table 4. Use of this "overestimate" ratio is intended to apply a measure of control to the apparent tendency of the AASHTO method to overestimate accident experience. Documentation of this apparent tendency at low ADT is to be included as part of the NCHRP Project 17-5 report.

Because of the nature of accident reporting, this analysis has thus far centered on those accidents which involved injuries and/or fatalities. The basic assumption is that while many property damage only (PDO) accidents go unreported, few injury or fatal accidents are believed to go unreported. Furthermore, costs associated with PDO accidents are comparatively small in relation to those for fatals and injuries. To illustrate this second point, an estimate of PDO costs using California data has also been included (see Table 6).

DISCUSSION

Detailed analysis of narrower (10-15 feet) medians containing concrete median barriers has not been performed since field data on medians

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of this size was not readily available. The reference material generally agrees, however, that accident experience could be expected to increase as the median width decreases. Figure 5.1.20 of the 1980 "Yellow Book" supplement suggests about a five percent increase.

The ADT used in this analysis for Route 287 was 55,000 (twowway) and the length of section used was eight miles. The predictive formulas on pages 26, 27, and 31 of the 1980 "Yellow Book" supplement was used for the AASHTO estimate of accidents, NHTSA data was used for accident costs (from page 24 of the same reference), while AASHTO fatal and injury rate percentages were estimated from Tables 5.1.11, 5.1.12 and the NHTSA data referenced on page 24. California injury and fatality percentages as reported for 1973 were used to make the overall cost differential estimates.

The aforementioned cost estimates have been based on single vehicle run-off-road (SVROR) estimates and reports of accidents which are median barrier related. It must be remembered that SVROR accidents comprise only a portion of the total roadway accidents. Furthermore, it is not known at this time whether the lack of a substantial clear recovery zone effects other types of accidents by restricting recovery tactics available to drivers during evasive maneuvers.

Finally, it is unclear what effect changes in the proportions of vehicle sizes in the fleet will have on projected accident rates and severity.

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Attachments
cc: Richard L. Hollinger

TABLE 1

ESTIMATES OF YEARLY MEDIAN ACCIDENTS PER DIRECTION OF TRAVEL
AASHTO DESIGN METHOD

Route 287 Roadway Data - (55,000 ADT Two Way)

Median Obstacle	Distance To Edge of Pavement	Length	Severity Index	Total Accidents	Fatal Acc. Per 100 Acc.	Injury Acc. Per 100 Acc.	Fatal & Injury Accidents
22 Foot Median Containing: Concrete Median Barrier	10 feet	8 miles	4.0	10.11/mi.	1	59	48.54
60 Foot Median Containing: Bridge Pier Guiderail	25.5 feet	250 ft. per bridge - 4 bridges	3.7	1.12	1	55	.62
Overhead Sign Bridge Footing Guiderail	25.5 feet	210 ft. per footing - 4 footings	3.7	1.00	1	55	.55
Bridge Parapet	12 feet	50 ft.	3.0-3.3				
		100 ft.	3.2				
		150 ft. 1 bridge	3.2	0.40	1	48	.19
Combined 60 Ft. Median Total							1.36

TABLE 2

Estimates of Yearly Median Accidents Per Direction of Travel
AASHTO Design Method

1973 California Data - Per Mile Average

Median	Distance to Edge of Pavement	ADT (Two Way)	Length	Severity Index	Total Accidents	Fatal Acc. Per 100 Acc.	Injury Acc. Per 100 Acc.	Fatal & Injury Accidents
Concrete Median Barrier (CMB)	10 feet	70,000	5280 ft.	4.0	13.18	1	59	7.91
Guiderail	10 feet	84,000	5280 ft.	3.7	15.74	1	55	8.66

TABLE 3

Comparison of AASHTO Predicted vs. Reported Accidents

Barrier	Reported Fatal & Injury Per MVM	MVM Per Mile	Predicted Fatal & Injury Accidents/Mile	Overestimate Ratio AASHTO: Cal Reported
CMB	.06	12.78	0.77	10.3:1
Guiderail	.07	15.33	1.07	8.1:1

TABLE 4

Computed Costs of Fatal & Injury Accidents

Barrier	Fatal Rate** Per MVM	Injury Rate** Per MVM	% Fatal of Fatal Plus Injury Accs.	% Injury Of Fatal Plus Injury Accs.	Cost Per 100 Fatal* & Injury Accidents
CMB	.0008	.06	1.32	98.64	$1,136,000
Guiderail	.0017	.07	2.37	97.63	$1,443,000

*NHTSA Accident Costs
$300,000 Per Fatal Accident
$ 7,500 Per Injury Accident

**1973 California Median Barrier Data

TABLE 5

COSTS OF FATAL & INJURY ACCIDENTS
(BOTH DIRECTIONS)

	Accidents* Per Year	Yearly Cost	20 Year Cost	CMB Difference After 20 Years
Guiderail	0.34	$ 4,900	$ 98,000	---
CMB	9.42	$107,000	$2,140,000	+2,042,000

TABLE 6

COSTS OF ACCIDENTS
(INCLUDING PDOs*)

	Ratio of PDO to Fatal & Injury**	PDOs Per Year	PDO Cost Per Year ($500/PDO)	Cost of All Accidents 20 Years	CMB Difference After 20 Years
Guiderail	2.6:1	0.88	$ 440	$ 102,400	---
CMB	3:1	28.3	$14,150	$2,423,000	+$2,320,600

*Property Damage Only

**California 1973

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